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2005 Minerals Yearbook

HELIUM

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HELIUM

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Sales of Grade-A helium (99.995% or greater purity) by private industry were 81.6 million cubic meters[2] (2.94 billion cubic feet) in the United States in 2005, and exports by private producers were 51.4 million cubic meters (1.85 billion cubic feet) for total sales of 133 million cubic meters (4.80 billion cubic feet) of U.S. helium, a 2.3% increase from 2004 (table 1). During 2005, domestic helium sales decreased by 4.1%, and helium exports increased by 14.5% compared with those of 2004.

Legislation and Government Programs

On October 9, 1996, the President signed the Helium Privatization Act of 1996 (Public Law 104-273). This legislation directed the Federal Helium Program to discontinue production and sale of refined helium by April 9, 1998. The Government's Exell helium plant was shut down in March 1998, and all components of the legislation were implemented as directed by the Act. Only one of the key components of this legislation is pending completion. The transfer of the Landis Property to the Texas Plains Girl Scout Council has been completed. The General Services Administration (GSA) is currently in the process of screening and disposal of the Amarillo Plant per Federal property management regulations. The environmental cleanup at the Exell helium plant is in progress with an expected completion date of June 30, 2006. Final documents will then be submitted to the Texas Commission on Environmental Quality (TCEQ) for the certificate of completion (COC). Upon receipt of the COC, the GSA will begin the disposal process.

Production

Domestic production data for helium were developed by the U.S. Bureau of Land Management (BLM) from records of its own operations as well as from its own high-purity helium survey, an annual voluntary canvass of private U.S. operations. Of the eight operations to which a survey request was sent, all responded, and those data plus data from BLM operations represent 100% of the total helium sales and recovery data listed in table 3.

In 2005, 13 companies operated 18 of 21 privately owned domestic helium plants, 13 of which extracted helium from natural gas (table 2). Two of the crude helium plants and one helium purification plant did not produce or extract helium during 2005. All but two extraction plants used cryogenic extraction processes. The total sales of U.S.-produced helium increased by 2.3% compared with those of 2004. All natural gas processed for helium recovery came from gasfields in Colorado, Kansas, Oklahoma, Texas, Utah, and Wyoming (fig. 1). During 2005, 10 private plants purified helium by using pressure swing adsorption technology. Nine privately owned plants that produced Grade-A helium also liquefied helium

Domestic measured helium reserves and indicated helium resources as of January 1, 2003, were estimated to be 8.5 billion cubic meters (305 billion cubic feet). The resources included measured helium reserves estimated to be 3.7 billion cubic meters (133 billion cubic feet) in natural gas from which helium is being extracted. The measured reserves included nearly 867 million cubic meters (31.2 billion cubic feet) of helium stored by the BLM in the helium storage conservation system. Measured helium reserves from indicated resources of natural gas with helium content greater than 0.05% were estimated to be 1.8 billion cubic meters (65 billion cubic feet). Indicated helium resources, a category slightly less certain than measured reserves, in natural gas with less than 0.3% helium were estimated to be 3.0 billion cubic meters (107 billion cubic feet). The majority of these indicated reserves were derived from the Potential Gas Committee designation of unconfirmed/probable reserves (Curtis, 2002). Approximately 2.5 billion cubic meters (91 billion cubic feet), or 98% of federally owned helium, is located in the Riley Ridge area in Wyoming and the Cliffside field in Texas.

Most domestic helium resources are in the Midcontinent and Rocky Mountain regions of the United States. The measured helium reserves are in approximately 102 gasfields in 11 States. Of these reserves, 98% is contained in the Hugoton field in Oklahoma, Kansas, and Texas; the Panoma field in Kansas; the Keyes field in Oklahoma; the Panhandle West and Cliffside fields in Texas; and the Riley Ridge area in Wyoming. During 2005, the BLM analyzed 100 natural gas samples from 11 States in conjunction with its program to survey and identify possible new sources of helium.

Consumption

In 2005, private industry supplied 100% of domestic helium demand. The major domestic end uses of helium were cryogenics (28%), pressurizing and purging (26%), welding (20%), and controlled atmospheres (13%). Other uses included chromatography/lifting gas/heat transfer (7%), leak detection (4%), and synthetic breathing mixtures (2%) (fig. 3). Cryogenics, specifically magnetic resonance imaging applications, dominated liquid helium use. Estimated 2005 domestic consumption by end use was based on a 2003-04 end-use survey conducted by BLM's Helium Operations to determine trends in helium usage.

In-kind crude helium sales regulations (43 CFR part 3195), which became effective on November 23, 1998, required helium

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[2]All metric helium volumes herein are at 101.325 kilopascals absolute (14.696 pounds per square inch absolute) and 15° C (59° F). Helium volumes, reported in parentheses following metric units, are measured in cubic feet at 14.7 pounds per square inch absolute and 70° F—1,000 cubic feet (14.7 pounds per square inch absolute and 70° F) equals 27.737 cubic meters (101.325 kilopascals absolute and 15° C) and 1 cubic meter (101.325 kilopascals and 15° C) equals 36.053 cubic feet (14.7 pounds per square inch absolute and 70° F).

refiners that sell helium to Federal agencies and their contractors to buy an equivalent amount of crude helium from the BLM. Such sales are referred to as "in-kind crude helium sales." In 2005, in-kind crude helium sales were 6.6 million cubic meters (236 million cubic feet). The sales were made to eight companies through contracts with the BLM.

Stocks

The volume of helium stored in the BLM helium conservation storage system, including the conservation pipeline network and the Cliffside field, totaled 731 million cubic meters (26 billion cubic feet) on December 31, 2005. The storage system contained crude helium purchased under contract by the BLM from 1962 to 1973 and privately owned helium extracted by industry from natural-gas-supplying fuel markets and stored under contract. This privately owned helium is returned to the owners as needed for purification to supply private demand. During 2005, 17.0 million cubic meters (611 million cubic feet) of private helium was delivered to the BLM's helium conservation system, and 74.1 million cubic meters (2.67 billion cubic feet) was withdrawn for a net decrease of 57.1 million cubic meters (2.06 billion cubic feet) of private helium in storage (table 4).

Transportation

Private producers and/or distributors shipped helium, predominantly as a liquid, in semitrailers, which delivered the liquid helium to distribution centers where some of it was gasified and compressed into trailers and small cylinders for delivery to end users. The remaining liquid helium was sold as bulk liquid or repackaged in dewars of various sizes for delivery.

Prices

In fiscal year 2005, the price that the BLM charged private companies for in-kind crude helium sales was $1.965 per cubic meter ($54.50 per thousand cubic feet).

Foreign Trade

In 2005, exports of Grade-A helium increased by 14.4% to 51.4 million cubic meters (1.85 billion cubic feet) compared with those of 2004 and accounted for 39% of sales of U.S.-produced helium; private industry supplied all U.S. helium exports (table 1). The increase in helium exports is attributed to increased demand for helium from Australia, China, Japan, the Republic of Korea, Mexico, Taiwan, and United Kingdom. Of the helium exported from the United States, 54% went to Asia, with Japan receiving 24% of total exports. Of the exported helium, 23% was shipped to Europe; collectively, Belgium, France, Germany, and the United Kingdom received 93% of the helium exported to Europe. Other exports were as follows: Canada and Mexico, 10%; Australia and New Zealand, 5%; South America, 4%; the Middle East, 2%; Africa, 1%; and Central America and the Caribbean, less than 1% each. Import tariffs on helium established on January 1, 1998, remained at the 3.7% rate for normal trade relations (NTR) nations and 25% for non-NTR nations.

World Review

Excluding the United States, world production capacity of helium in 2005 increased to an estimated 46 million cubic meters (1.65 billion cubic feet) (table 5). The increased capacity comes from a new production facility at Qatar and an expansion project in Algeria. The Skikda, Algeria, helium expansion project has added at least 8.3 million cubic meters (300 million cubic feet) of new production, and the new helium extraction facility at Qatar added 8.3 million cubic meters (300 million cubic feet) to the global helium market. All known helium produced outside the United States in 2005 was extracted in Algeria, Poland, Qatar, and Russia.

Outlook

In 2005, total market sales for U.S.-produced helium increased by 2.3% compared with those of 2004. From 2000 to 2005, the market growth rate was 1% per year, while from 1995 to 2005, the market growth rate was 3.3% per year. Sales of U.S.-produced helium again were expected to increase by 2% to 3% for 2006. With the problems encountered in transporting the new helium production from Algeria and Qatar, demand for exports of helium produced in the United States is expected to rise again in 2006. U.S. exports of helium in 2006 will be determined by demand for helium from overseas, which has increased during the past 3 years.

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TABLE 1
TOTAL SALES OF GRADE-A HELIUM
PRODUCED IN THE UNITED STATES[1]

(Million cubic meters)

Year	Domestic sales	Exports[2]	Total sales
2001	89.0	43.0	132
2002	87.6	39.5	127
2003	80.8	41.3	122
2004	85.1	44.9	130
2005	81.6	51.4	133

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Source: U.S. Census Bureau.

TABLE 2
OWNERSHIP AND LOCATION OF HELIUM EXTRACTION PLANTS IN THE UNITED STATES IN 2005

Owner or operator	Location	Product purity
Air Products and Chemicals, Inc.	Hansford County, TX	Grade-A helium.[1]
Do.	Liberal, KS	Do.
SemKan L.P.[2]	Dodge City, KS	Crude helium.
BOC Gases	Otis, KS	Grade-A helium.[1]
BP America Inc.	Sunray, TX	Crude helium.
Do.	Ulysses, KS	Do.
Midstream Energy Services, LLC[3]	Keyes, OK	Crude and Grade-A helium.[1]
K-L Energy Partners LLC[4]	Lakin, KS	Crude helium.
Duke Energy Field Services	Cheyenne Wells, CO	Crude and Grade-A helium.[1]
Do.	Hansford County, TX	Crude helium.
Do.	Liberal, KS	Do.
Do.	Borger, TX	Do.
Exxon Mobil Corp.	Shute Creek, WY	Crude and Grade-A helium.[1]
Newpoint Gas Services, Inc.[5]	Shiprock, NM	Grade-A helium.
ONEOK, Inc.[5]	Bushton, KS	Crude helium.
Do.[6]	Scott City, KS	Do.
Pioneer Natural Resources Co.	Fain, TX	Do.
Do.	Satanta, KS	Do.
Praxair, Inc.	Bushton, KS	Grade-A helium.[1]
Do.	Ulysses, KS	Do.
EnCana Oil & Gas (USA) Inc.[7]	Moab, UT	Crude and Grade-A helium.[1]

[1]Including liquefaction.
[2]SemKan L.P. purchased plant from BCCK Engineering Inc. in November 2004. Plant did not produce any helium during 2005.
[3]Midstream Energy Services, LLC purchased plant from Nathaniel Energy in March 2006.
[4]K-L Energy Partners, LLC. purchased plant from Regency Gas Services, LP in early 2005.
[5]Plant did not produce any helium during 2005.
[6]Output is piped to Ulysses, KS, for purification.
[7]EnCana Oil & Gas (USA) Inc. purchased plant from Tom Brown, Inc. in late 2004.

TABLE 3
HELIUM RECOVERY IN THE UNITED STATES[1]

(Thousand cubic meters)

	2001	2002	2003	2004	2005
Crude helium:					
Bureau of Land Management (BLM) sold (in-kind and open market)	--	--	51,800	29,300	41,400
Private industry:					
Private helium accepted and stored by BLM[1]	18,000	16,600	19,400	19,100	17,000
Helium withdrawn from storage	-62,900	-56,300	-54,500	-63,100	-74,100
Total net helium put into storage	-44,900	-39,700	-35,100	-44,000	-57,100
Grade-A helium:					
Private industry sold	131,900	127,100	122,000	130,000	133,000
Total helium stored	-44,900	-39,700	-35,100	-44,000	-57,100
Helium recovery from natural gas	87,000	87,400	86,900	86,000	75,900

-- Zero.

[1]Negative numbers denote a net withdrawal from BLM's underground storage facility, a partially depleted natural gas reservoir at the Cliffside field near Amarillo, TX.

TABLE 4
SUMMARY OF BUREAU OF LAND MANAGEMENT HELIUM CONSERVATION STORAGE SYSTEM OPERATIONS[1, 2]

(Thousand cubic meters)

	2003	2004	2005
Helium in conservation storage system on January 1:			
Stored under BLM conservation program[3]	822,000	770,000	741,000
Stored for private producers under contract	45,000	62,000	47,000
Total[3]	867,000	832,000	788,000
Input to system:			
Net deliveries from BLM plants	--	--	--
Stored for private producers under contract	19,400	19,100	17,000
Total[3]	19,400	19,100	17,000
Redelivery of helium stored for private producers under contract	-54,500	-63,100	-74,100
Net addition to system[3]	-35,100	-44,000	-57,100
Helium in conservation storage system on December 31:			
Stored under BLM conservation program[3]	770,000	741,000	699,000
Stored for private producers under contract	62,000	47,000	32,000
Total[3]	832,000	788,000	731,000

-- Zero.

[1]Crude helium is injected into or withdrawn from BLM's underground storage facility, a partially depleted natural gas reservoir at the Cliffside field near Amarillo, TX.

[2]Negative numbers denote a net withdrawal from BLM's storage facility.

[3]Net additions to system do not include in-kind crude sales or transfers. Totals, however, do include crude sales and transfers.

TABLE 5
WORLD GRADE-A HELIUM
ANNUAL PRODUCTION CAPACITY
AS OF DECEMBER 31, 2005

(Million cubic meters)

	Capacity
United States[1]	152
Rest of world[e]	46
Total[e]	198

[e]Estimated.

[1]Includes plants on standby as well as operating plants.

FIGURE 1
MAJOR U.S. HELIUM-BEARING NATURAL GAS FIELDS

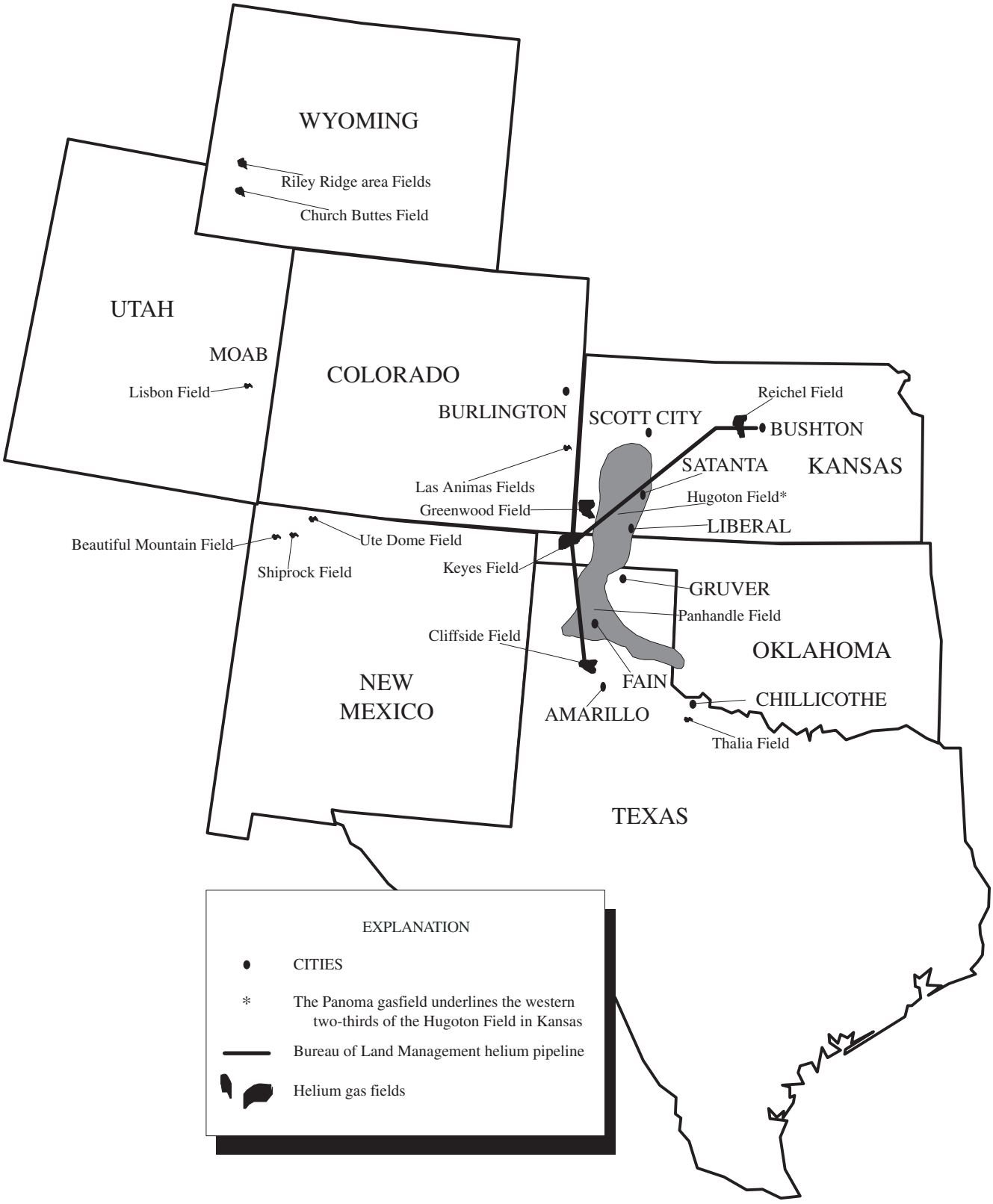


FIGURE 2
HELIUM RECOVERY IN THE UNITED STATES

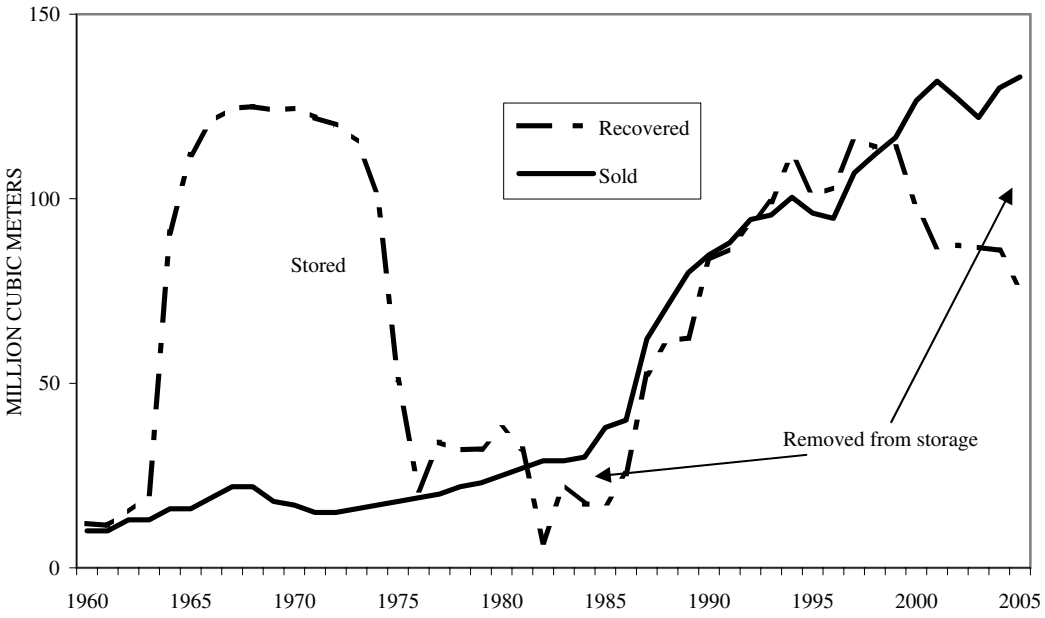
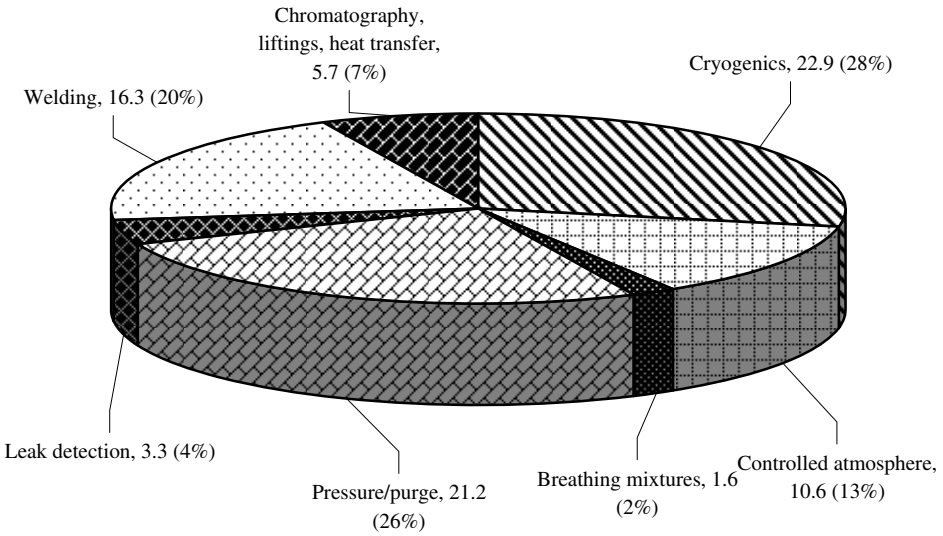


FIGURE 3
ESTIMATED HELIUM CONSUMPTION, BY END USE, IN THE UNITED STATES IN 2005[1]

(Million cubic meters)



[1]Total helium used in the U.S. in 2005 was estimated to be 81.6 million cubic meters.